Complexity Analysis

Find the Time Complexities of the following codes:

(A)

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}
```

Assume that rand() is O(1) time function.

(B)

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    for (j = 0; j < N; j++) {
        a = a + j;
    }
}
for (k = 0; k < N; k++) {
    b = b + k;
}
```

(C)

```
int a = 0;
for (i = 0; i < N; i++) {
    for (j = N; j > i; j--) {
        a = a + i + j;
    }
}
```

(D)

```
int a = 0, i = N;
while (i > 0) {
    a += i;
    i /= 2;
}
```

(E)

```
void fun(int n, int k) {
    for (int i=1; i<=n; i++) {
        int p = pow(i, k);          //Assume this step takes O(1) time
        for (int j=1; j<=p; j++) {
            // Some O(1) work
        }
    }
}
```

(F)

```
int count = 0;
for (int i = N; i > 0; i /= 2) {
    for (int j = 0; j < i; j++) {
        count += 1;
    }
}
```

(G)

```
int i, j, k = 0;
for(i =n/2;i<=n;i++) {
    for (j = 2; j <= n; j = j * 2) {
        k = k + n/2;
    }
}
```

(H)

```
int j = 0;
for(int i = 0; i < n; ++i) {
    while(j < n && arr[i] < arr[j]) {
        j++;
    }
}
```